

Of the above species *P. Franckii*, in spite of its conspicuous white band, is almost the dullest; the male is a little brighter in colouring than the female, and has a slightly narrower white band across the primaries, but does not otherwise differ. It comes only from Java (five examples).

Even more dull in colour is *P. uniformis*, and the absence of the white band makes it appear more sombre than it really is. It differs in many respects from *P. Franckii*, the greater portion of the outer edge of the blue belt being occupied by a long shallow sinus instead of being acutely zigzag; some of the markings on the under surface are also confluent and the discoidal spots are clearer in outline. I can only guess at the probable habitat, as at present we only possess one male.

P. angelica is the brightest of all, the female being slightly less so than the male; the blue belt is sometimes a little wider than in *P. Franckii* and its outer edge is much less zigzag; it has white dashes on the belt in both sexes; the markings below are very similar, but the ground-colour is noticeably different. It occurs in Tenasserim, Borneo, and Sumatra (five examples).

P. regalis is duller in colouring than the preceding, and corresponds with *P. uniformis* in the absence of white on the blue belt; it, however, differs from the three preceding species in the great width of the blue belt, the blue marginal spots on the primaries, the shorter and less caudate secondaries, the cruciform character of the black submarginal markings on under surface of primaries, the filled-in discoidal markings on all the wings, the inner half of external area of secondaries below being greyish olivaceous crossed by oblong black patches with reddish external borders, the shorter green and black submarginal arched spots, and several other characters to be described hereafter. I have only seen one male of this very distinct species, from Manipur.

VII.—Notes on *Mesozoic Cockroaches*.

By SAMUEL H. SCUDDER*.

I. *Pterinoblattina*, a remarkable Type of *Palæoblattariæ*.

Among the many fossil cockroaches figured by Westwood thirty years ago was one which Giebel afterwards named *Blatta pluma*, on account of the resemblance of its neuriation to the barbs of a feather, where the shaft is on one side. Several species are now known, and on account of this curious arrangement of the veins, the generic name

* From the Proc. Acad. Nat. Sci. Philad, 1885, pp. 105-115.

PTERINOBLATTINA (πτερίνοις)

is proposed. The wings were very broad, expanding considerably beyond the base, broadest beyond the middle, and filled with an abundance of branching veins. The mediastinal, scapular, and externomedian veins ran close together, side by side, in a perfectly straight course (the shaft of the feather), from near the middle of the base of the wing toward and nearly to a point on the costal margin a little within the apex of the wing, and the superior mediastinal and inferior externomedian branches, crowded closely together, parted from this apparently common stem at nearly similar angles on either side of it. The complete independence of the mediastinal, scapular, and externomedian veins shows that the genus falls in the Palæoblattariae. The species are all small.

Pterinoblattina pluma.

Blatta pluma, Gieb. Ins. der Vorw. p. 322. Figured by Westw. Quart. Journ. Geol. Soc. Lond. x. pl. xv. fig. 14†.

The specimen, the original of which I have had the privilege of studying, by the favour of my kind friend, the Rev. P. B. Brodie, is rather imperfect, and a little deceptive from the fact that just that portion of the tip is missing which contains the scapular branches; it is probable, however, from the longitudinal character of the apical externomedian offshoots, that the species more closely resembles *P. chrysea* than *P. intermixta*. All the mediastinal branches are simple, parallel, equidistant, almost straight, closely crowded, and part from the main stem at an angle of about 45°. The externomedian branches, the only others preserved, part at a less angle, gradually become quite horizontal apically, are nearly as close at base as the scapular branches, and as most of them fork and even re-fork, though with entire irregularity, become excessively crowded towards the margin. The length of the fragment is 9 millim., its breadth 5 millim. Probably the wing was 12 millim. long, and 5.5 millim. broad.

It was found in the Corbula or Pecten beds of the Dorset Purbecks of England.

Pterinoblattina penna, sp. nov.

The single specimen of this species at hand is preserved in much the same manner as the last, but shows a fragment of the internomedian region. The three principal veins approach each other very gradually, so as to give them the appearance of a tapering rod. The mediastinal branches part from the stem at nearly a right angle near the base of the wing, gradu-

ally increasing in obliquity distally until they form an angle of 45° with it; they are slightly curved, the concavity outward, very closely crowded, and about every third one forked near the middle, but with no regularity. The scapular branches are not preserved, but as in *P. pluma*, and for the same reason, they probably resemble *P. chrysea* rather than *P. intermixta*. The externomedian branches are very closely crowded, generally straight, part from the stem at an angle of 45° next the base, and become almost wholly longitudinal at the apex; they fork about as frequently as, and more irregularly than, the mediastinal branches. The internomedian area extends far out on the wing, and its branches (what few can be seen) resemble those of the preceding area, and at its extremity are parallel to them. Length of fragment 13 millim., width 9 millim.; probable length of wing 15 millim., probable width 9 millim.

Described from a specimen from the English Purbecks sent me for examination by Rev. P. B. Brodie.

It is not impossible that the fragment of a larger wing figured by Westwood (Quart. Journ. Geol. Soc. Lond. 1854, pl. xvii. fig. 7), from the Lower Purbecks of Durdlestone Bay, may be a species very close to this.

Pterinoblattina chrysea.

Blattina chrysea, E. Geinitz, Zeitschr. deutsch. geol. Gesellsch. 1880, p. 520, pl. xxxii. fig. 2.

In this case we have a more perfect wing, the tip being almost completely preserved. The mediastinal vein terminates before the middle of the outer half of the costal border, and is furnished with simple, straight, oblique branches, not so numerous as in the other species, to judge by the figure, though they are spoken of by Geinitz as "very numerous and closely crowded." Just before the scapular reaches the tip of the mediastinal, it turns parallel to the costal margin, runs to the upper tip of the wing, and emits branches similar to those of the mediastinal, but of course of equal length. All the externomedian branches run almost longitudinally, are straight, sometimes forked, and appear from the figure to be less crowded than the mediastinal branches, though they are compared by Geinitz to the barbs of a feather. The internomedian runs to just beyond the broadest part of the wing, being thus longer than the mediastinal, and sends less crowded, gently curved, usually forked, rather short branches to the border. The few anal branches curve and strike the inner margin. Length 5 millim., breadth about 2.25 millim.

From the Lias of Dobbertin, Germany. The description is drawn up from the data given by Geinitz.

Pterinoblattina intermixta, sp. nov.

A nearly complete wing of this species has almost the same shape as *P. chrysea*, but the upper part of the apex is more produced. The mediastinal vein terminates before the middle of the outer half of the wing, and the area narrows more gradually than in any of the others; its branches are gently curved, and often forked, but not excessively crowded. Just before reaching the tip of the mediastinal the scapular vein suddenly bends towards the apex, running subparallel to, but away from, the costal margin, terminating at the tip and emitting a crowd of curved and forked branches. The closely crowded externomedian branches part at an angle of 45° with the stem, are straight, and forked only just before the tip, forming a tolerably regular belt of crowded veinlets along the margin. The basal branches, however, are interfered with and affected by the internomedian vein, which is nearly straight, at first running plump against the externomedian branches, curves then downward parallel to these, and terminates a little before the mediastinal; it is furnished abundantly with branches curving like its extremity and branching next the border like the externomedian branches; but where it abuts against these latter they simulate the appearance of the internomedian branches so as to appear as if a part of the internomedian area, and thus give the latter the appearance of extending out beyond the broadest part of the wing. The anal appears to be insignificant, reaching less than a third the distance from the base, and resembling a narrower and smaller internomedian area. Length of fragment 10.5 millim., probable length of wing 12 millim.

Received from Rev. P. B. Brodie, as coming from the Upper Lias of Alderton, Gloucestershire, England.

Pterinoblattina hospes.

Ricania hospes, Germ. Acta Acad. Leop. Carol. xix. pp. 220, 221, pl. xxiii. fig. 18.

Germer took this for one of the Fulgorina, in the neighbourhood of *Ricania* and *Pæcilopectera*. It is pretty plain, however, that it belongs here, though the figure given by Germer is not sufficiently clear to enable one to formulate any characteristics. Assmann thought it a Neuropteran, falling in the neighbourhood of *Drepanopteryx*.

It comes from the Oolite of Solenhofen.

Pterinoblattina gigas.

Ricania gigas, Weyenb. Arch. Mus. Teyl. ii. pp. 270, 271, pl. xxxv. fig. 23.

Following Germar, Weyenbergh placed this enormous species in *Ricania*; but it as evidently falls here and bears a close general resemblance, excepting in size, to *P. penna* of the Purbecks. *Ricania fulgens*, Gieb. (Brodie, pl. iv. fig. 12), from the Vale of Wardour, has nothing to do with *Pterinoblattina*.

This gigantic form also comes from the Oolite of Solenhofen.

II. *Triassic Blattariæ from Colorado*.

In a recent paper I described some of the Triassic Palæoblattariæ, which I mentioned as interesting on account of their special relation to the Blattariæ of the same formation. Brief diagnoses of these latter forms will therefore have some interest, and I mention them in the order of their relation to the Palæoblattariæ.

NEORTHROBLATTINA (*νέος, ὄρθρος*), gen. nov.

In this genus the wings are about two and a half times longer than broad, with fairly well-rounded apices, the mediastinal and scapular veins amalgamated into a single vein, which extends nearly to the tip, and in the middle of the wing occupies nearly one half its width. The internomedian vein is of varying importance, and in the large anal area the veinlets terminate on the margin; the anal furrow is strongly arcuate and deeply impressed.

Neorthroblattina albolineata, sp. nov.

The single wing has lost the tip, but all the essential features are preserved excepting the form of the tip. The wing is very dark-coloured, and the veins appear as very pale lines upon it. The costal margin is gently and equably arched, while the inner margin is perfectly straight. The externomedian vein is little developed, first forking, and then not widely, in the middle of the wing, its fuller development being prevented by the ample and unrestricted development of the internomedian vein, which runs in a full rounded course nearly to the tip of the wing. The anal area is interesting because the veins of the upper half run close to, but do not impinge upon, the anal furrow, curving downward just before reaching it, and either running into the next vein below and terminating there, or continuing parallel to the furrow and terminating on the inner border. Length of fragment 7

millim.; probable length of wing 9 millim.; breadth of wing 3·5 millim.

Triassic beds near Fairplay, Colorado.

Neorthroblattina Lakesii, sp. nov.

Several specimens of this species were found. The costal margin is arched, as in the last species, and the inner margin has an almost equal opposite curvature. The externomedian vein has a very sinuous course, and forks before the middle of the wing with abundant neuration, occupying on the margin the entire tip of the wing and almost the outer half of the lower margin, while the internomedian is reduced to an arching vein, extending but little beyond the anal furrow, and with only two or three branches; the anal veins are all parallel to the anal furrow and simple. Length of wing 9 millim.; breadth 3·5 millim.

Triassic beds near Fairplay, Colorado.

This species is named after Prof. Arthur Lakes, of the School of Mines in Golden, Colorado, who first made known these beds, this species being one of the first discovered by him.

Neorthroblattina rotundata, sp. nov.

The costal margin in this species is very strongly arched, while the inner margin is straight, giving a very different aspect to the wing. It closely resembles the preceding species in the mediastino-scapular and anal areas, and also in the peculiarities of the externomedian vein, excepting that the latter does not encroach to so large a degree upon the internomedian, the terminal offshoot of which creeps along the border so as to limit the marginal extent of the externomedian area almost as much below as above, although the branching of the externomedian vein is scarcely lessened. Length of wing 8·5 millim.; breadth 3·3 millim.

Triassic beds near Fairplay, Colorado.

Neorthroblattina attenuata, sp. nov.

This species departs from the typical forms in its slenderness and pointed apex, but it agrees so fairly in general structure that it would best be placed here. The costal margin is not regularly arched, being flattened mesially, while the whole wing tapers beyond the basal third; the inner margin is also arcuate, and the tip bluntly pointed. The mediastino-scapular vein terminates considerably before the apex, and the oppositely arcuate internomedian reaches

almost as far out, the branches of both nearly always simple. The anal veins are only slightly irregular. Length of wing 15 millim.; breadth 4 millim.

Triassic beds near Fairplay, Colorado.

SCUTINOBLATTINA (*σκούτινος*), gen. nov.

In this genus, composed of small species, the front wings are decidedly more coriaceous than the hind wings, so that the neuration is often more or less obscured by it. The wing itself is convex, as in the modern *Phoraspis*, and subtriangular in form, its greatest width being near the base, while the tip is bluntly pointed. The mediastinal and scapular veins are again blended into one, which, instead of having a sinuous course, is nearly or quite straight, and terminates below the apex of the wing, while the externomedian vein follows closely parallel to it, and the oblique veins of this and the internomedian veins follow each other so as to make it difficult to tell where the line of demarcation may lie. The anal veins sometimes fall on the margin and sometimes on the anal furrow.

Scutinoblattina Brongniarti, sp. nov.

In this interesting species the wings are very strongly convex at the base and the whole surface is flecked with dark spots. The branches part from the main veins at a similar angle on either side of the middle of the wing. The anal area extends nearly to the middle of the wing, where it is marked by a considerable emargination, and its veins are frequent, oblique, mostly simple, and terminate on the margin. Length of wing 7 millim.; breadth 3 millim.

Triassic beds near Fairplay, Colorado.

Named after Mr. Charles Brongniart, of Paris, well known for his remarkable discoveries among the older fossil insects.

Scutinoblattina intermedia, sp. nov.

This species resembles the last, but is not marked by any dots, and the anal area, while shorter, shows no emargination of the border at its extremity; the anal veins are very close, parallel to the inner margin, and terminate not on the margin, but on the anal furrow. It further differs in that the externomedian branches are considerably more longitudinal than those terminating on the costal margin. Length of wing 7 millim.; breadth 2.75 millim.

Triassic beds near Fairplay, Colorado.

Scutinoblattina recta, sp. nov.

This species, the smallest and most abundant of all in the Triassic rocks, is rather slenderer than the others, and has the surface finely reticulated. The mediastino-scapular and externomedian veins run side by side in perfectly straight lines from the middle of the base to the middle of the tip, the branches, very few in number, parting similarly on the two sides. The costal is more arched than the inner margin, and where they can be made out the one or two anal veins seem to run to the margin; but all the veins on the wing are exceedingly obscure. Length of wing 6.3 millim.; breadth 2.4 millim.

Triassic beds near Fairplay, Colorado.

III. On the Genera hitherto proposed for Mesozoic Blattarie.

Brodie, in 1845, published figures of a considerable number of Mesozoic cockroaches, but named only one, which he referred to the genus *Blatta*. In 1852 Heer figured and named another under the equally broad generic name *Blattina*. Westwood, in publishing in 1854 a considerable addition to our knowledge of the cockroaches of the English Mesozoic rocks, separated four somewhat peculiar forms under the generic term *Blattidium*; the rest were unnamed. Giebel, two years later, named a considerable proportion of Brodie's and Westwood's species; while placing a considerable number under *Blatta* and *Blattina*, he divided the rest under three new genera—*Rithma*, *Elisama*, and *Nethania*—the last including the only one of Westwood's species of *Blattidium* which was noticed. On the other hand, Heer, in 1864, divided all the Mesozoic species between *Blattina* and *Blattidium*, placing in the latter all of Westwood's species, together with all those referred to new genera by Giebel. Finally, a few years ago, E. Geinitz proposed for a Triassic species described by him, and one previously published by Heer, the new generic term *Mesoblattina*.

There is no question that the forms described by Westwood, after eliminating the one separated by Giebel under the name of *Nethania*, form a very distinct group; but none of the species since added to it belong here, so that

BLATTIDIUM

should stand much as first limited (though not described) by Westwood. Probably, however, it should be still further restricted by the elimination of *B. achelous*, Westwood. The

wings are exceedingly long and slender, particularly in *B. symyrus*, Westw. (which may be taken as the type), with nearly or quite parallel sides. The mediastinal vein terminates not far from the middle of the wing, and sends out a multitude of crowded offshoots to the margin. The scapular vein unites in the basal third of the wing with the externomedian, and throws off rather distant oblique veins, first to the mediastinal and afterwards to the border. The externomedian and internomedian veins have together several more or less forked very longitudinal branches, all of which appear to terminate on the apical margin, while the main anal vein, longitudinally oblique, extends nearly as far as the mediastinal, and the outer half of the inner margin of the wing seems to have no veins falling upon it; the veins of the anal area run obliquely from the margin upward and outward to the main anal vein.

As to the genera of Giebel, six species are placed by him in *Rithma*, two in *Elisama*, and one in *Nethania*. The species of *Nethania* is rather too uncertainly figured to determine by the illustration alone where it belongs. The two species of

ELISAMA

figured by Brodie certainly belong together, and seem to constitute a natural genus. By the kindness of the Rev. Mr. Brodie I have seen the original of his pl. v. fig. 1 (*Elisama Kneri* of Giebel) and another specimen which seems to belong to *E. minor*, so that I can more fully characterize this genus. The mediastinal and scapular veins appear here to constitute one vein, and to occupy almost the entire upper half of the wing. The externomedian and internomedian veins fill the lower half between them with parallel veins, which at their origin curve at once strongly downward, and then run longitudinally to the apical margin, leaving only the meagrest possible space to the anal area, which is indeed broken off from the two specimens I have seen, and does not appear in the figures published by Brodie. In addition, in both the species there is an abundant but imperfect cross-venation at the base of the externomedian and internomedian areas, and on the latter a large discoloured spot, which may of course be confined to these two species only.

RITHMA

contains more incongruous material. I have myself recognized in the English species I have examined autoptically only one of the species referred to it, named *R. Murchisoni*

by Giebel, and this is certainly to be referred to *Mesoblattina*, Geinitz. *R. ramificata* is quite too imperfect to be considered until better specimens occur. It is probable that *R. antiqua* should be separated from the others, and the same may be true of *R. Westwoodi*. This leaves two species, *R. purbecensis* and *R. Morrisi*, which agree well together, and represent a group which seems to have flourished in Mesozoic times, as I have seen a number of species from the English Lias belonging to it; and *Blattina formosa*, Heer, from Schambelen, and *Blattina liasina*, Gieb., figured by Brodie, also belong here. These wings are rounded wedge-shaped, with the amalgamated mediastinal and scapular area so large as to occupy about half of the wing, the vein running in a slightly sinuous course to, or even below, the tip. The anal area is generally pretty large, convex, and filled with parallel veins, which terminate on the margin. The space between is divided about equally between the externomedian and internomedian veins, which generally take a somewhat sinuous course, and fork with tolerable abundance, filling the space with graceful lines, spreading like (sinuous) rays of a fan. The genus is closely related to *Neorthroblattina* of the American Trias, but differs from it in the much greater area covered by the amalgamated mediastinal and scapular veins.

The following described species may be referred to it:—

Rithma purbecensis.

Rithma purbecensis, Gieb. Faun. d. Vorw. iii. p. 319. Figured by Westw. Quart. Journ. Geol. Soc. Lond. x. pl. xviii. fig. 32.

Lower Purbecks, Durdlestone Bay, England.

Rithma Morrisi.

Rithma Morrisi, Gieb. Faun. d. Vorw. iii. p. 319. Figured by Westw. Quart. Journ. Geol. Soc. Lond. x. pl. xviii. fig. 34.

Lower Purbecks, Durdlestone Bay, England.

Rithma formosa.

Blattina formosa, Heer, Lias Ins. Aarg. p. 15, pl. H. figs. 41, 42; id. Urw. Schweiz. pl. vii. figs. 1, 1 b

Lias, Schambelen, Switzerland.

Rithma liasina.

Blattina liasina, Gieb. Faun. d. Vorw. iii. p. 317. Figured by Brodie, Foss. Ins. Engl. pl. viii. fig. 12.

Lower Lias of Wainlode, Strensham, England.

MESOBLATTINA,

proposed by E. Geinitz, as stated, for two Liassic species of continental Europe, is a most prolific type, a considerable number of English Mesozoic forms falling here, and among others, as remarked above, those figured by Westwood and described by Giebel under the name of *Rithma Murchisoni* and *R. antiqua*. The former of these, as well as a considerable number of new species, have been sent to me by Mr. Brodie. In this genus the basal sweep of the externomedian and internomedian veins is very noticeable, following as they do the curve of the anal furrow before branching to fill the lower half of the wing. In this respect they remind one strongly of *Elisama*; but the wings are much slenderer than there, and, what is of more importance, the anal area is of the normal size, while next the humeral angle is seen a flat unveined field, so frequent in modern cockroaches. To this belong, among others, the following species:—

Mesoblattina protypa.

Mesoblattina protypa, Gein. Zeitschr. deutsch. geol. Gesellsch. 1880, pp. 519, 520, pl. xxii. fig. 1.

Lias of Dobbertin, Germany.

Mesoblattina angustata.

Mesoblattina angustata, Gein. Zeitschr. deutsch. geol. Gesellsch. 1880, pp. 519, 520.

Blattina angustata, Heer, Viert. naturf. Gesell. Zürich, ix. pp. 288–300, pl. fig. 6.

Lias of Schambelen, Switzerland.

Mesoblattina dobbertinensis, Gein.

Mesoblattina dobbertinensis, Gein. Zeitschr. deutsch. Geol. Gesellsch. 1884, p. 570, pl. xiii. fig. 1.

Lias of Dobbertin, Germany.

Mesoblattina Murchisoni.

Rithma Murchisoni, Gieb. Ins. d. Vorw. p. 319. Figured by Westw. Quart. Journ. Geol. Soc. Lond. x. pl. xviii. fig. 43.

Lower Purbecks of Durdlestone Bay, England.

Mesoblattina antiqua.

Rithma antiqua, Gieb. Ins. d. Vorw. p. 319. Figured by Westw. Quart. Journ. Geol. Soc. Lond. x. pl. xvii. fig. 10.

Lower Purbecks of Durdlestone Bay, England.

Mesoblattina elongata.

Blatta elongata, Gieb. Ins. d. Vorw. p. 322. Figured by Westw. Quart. Journ. Geol. Soc. Lond. x. pl. xv. fig. 23.

Middle Purbecks of Durdlestone Bay, England.